REMARKS

Entry of the foregoing and reexamination of the above-identified application is respectfully requested.

New claims 20-23 have been added. These claims parallel the language of claims 1-5 and 7 in Brugliera et al. Since claims using this language have previously been found patentable by the Patent Office, this language should also be found patentable in the instant application. It is noted that considerably more sequence information is provided for the 5GT gene in the instant application than was provided for the 3RT gene in Brugliera et al. Applicants should thus be entitled to the scope of claims as now recited in at least claims 20-23. Support for these claims may be found in the instant application at the very least in original claims 1-5.

New claim 24 has also been added. Support for this claim may be found at the very least in original claims 1-5.

No new matter has been added by these amendments.

Applicants note the restriction requirement under 35 U.S.C. §§121 and 372. Applicants confirm the election of the Group I invention, claims 1-7, 9-11 and 16-19. Claims 8 and 12-15 are withdrawn from further consideration by the Examiner, and have been canceled by the instant amendment without prejudice or disclaimer. Applicants reserve the right to file a divisional application directed to these claims.

Applicants note the objection to the specification in view of the difference in the numbers assigned to the sequences in the sequence listing submitted with the original

Preliminary Amendment to the application and the sequence listing submitted on May 12, 2000. The specification has been corrected so that the correct sequences are identified in the application.

Claims 1-7, 9-11 and 16-19 have been rejected under 35 U.S.C. §112, first paragraph, as allegedly not being enabled by the specification. This rejection is respectfully traversed.

As acknowledged in the Official Action, the specification is enabling for and provides the plant 5GT cDNAs from Perilla, Verbena, Torenia and Petunia coding for enzymes having flavonoid 5-transglycosylation activity or their expression in yeast cells. These particular species are specifically described in the specification. Contrary to the assertion in the Official Action, however, this description would enable one skilled in the art to identify and clone additional genes from other sources using conventional techniques, such as hybridization. For example, according to Kossmann et al, which was cited in the Official Action, at page 276, cDNA of potato which is a dicot plant, was cloned using a SSS cDNA of rice, which is a monocot plant.

Moreover, as taught in the specification, there is a significant degree of homology between the different species in the amino acid sequence of the protein. For example, *see,* page 7, lines 15-28. Such information was not provided in Amgen Inc. v. Chugai Pharmaceutical Col. Ltd.

Therefore, using the cDNAs provided by applicants additional genes having the same activity could be readily identified by a person skilled in the art. No undue

experimentation would be necessary. Withdrawal of the rejection is thus respectfully requested and believed to be in order.

Claims 1-7, 9-11 and 16-19 have also been rejected under 35 U.S.C. §112, first paragraph, as allegedly containing subject matter which was not described in the specification. This rejection is respectfully traversed.

The test for determining compliance with the written description requirement is whether the disclosure of the application as originally filed reasonably conveys to the artisan that the inventor had possession at that time of the later claimed subject matter, rather than the presence or absence of literal support in the specification for the claim language. In re Kaslow, 217 USPQ 1059, 1076 (Fed. Cir. 1983); Ex parte Remark, 15 USPQ2d 1498, 1506 (PBAI 1990). Given the description in the application of the genus of genes, the particular cDNAs described and the ability of one skilled in the art to use the information provided to identify additional genes, as discussed *supra*, it is respectfully believed that the application would describe the invention as claimed to a person skilled in the art. This information would also convey to the skilled artisan that the inventors had possession of the invention as claimed.

Moreover, in view of the significant degree of homology between the different species in the amino acid sequence of the protein, the description of particular sequences as provided in the specification would sufficiently describe the genus as claimed to a person skilled in the art. For example, *see,* page 7, lines 15-28. Such information as given in the instant application was not provided in University of California v. Eli Lilly and Co.

Withdrawal of the rejection is respectfully requested and believed to be in order.

Claims 2-7, 9-11 and 16-19 have been rejected under 35 U.S.C. §112, second paragraph, as allegedly being indefinite. This rejection is respectfully traversed.

With respect to claims 2 and 16, the recitation of "a protein modified by addition and/or deletion of one or more amino acids and/or substitutions" is allegedly unclear where and which amino acids are modified. It is respectfully submitted that one skilled in the art would recognize that the amino acid sequence could be modified and then determine whether the modified protein still has the activity recited in the claim. Thus, this phrase is not indefinite to a person skilled in the art.

In claims 2-5, the Examiner helpfully recommended amending the claim to recite the amino acid sequence "as shown" in any one of SEQ ID NOs: 7-10. This recommendation has been incorporated into the claims. Applicants appreciate the helpful suggestion by the Examiner.

Claims 10-11 and 16-19 were said to be indefinite in the recitation of "identical properties." "Identical properties" allegedly is not defined in the specification and it is allegedly unclear what properties are identical. It is respectfully believed that this phrase would be sufficiently clear to a person skilled in the art. One skilled in the art, reading the application as whole, would recognize that the phrase refers to the activity of transferring a glycoside to the 5-position of a flavonoid.

Withdrawal of the rejection of the claims under 35 U.S.C. §112, second paragraph, is thus respectfully requested and believed to be in order.

Claim 1 has been rejected under 35 U.S.C. §101 as allegedly being directed to non-statutory subject matter. This claim has been amended as suggested by the Examiner to recite an "isolated" gene.

Withdrawal of the rejection of the claims under §101 is thus respectfully requested and believed to be in order.

Claim 1 has been rejected under 35 U.S.C. §102(b) as allegedly being anticipated by Teusch et al or Jonsson et al. This rejection is respectfully believed to now be moot in view of the amendment.

Claim 1 has been amended to recite an "isolated" gene. Neither Teusch et al or Jonsson et al teach an isolated gene as claimed. Each is cited as teaching naturally occurring plants which would only inherently have the gene. However, neither reference teaches the gene as claimed specifically, or teaches that it is or could be isolated, as now recited in the claim.

Withdrawal of this rejection is thus respectfully requested and believed to be in order.

Claims 1-5 have been rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Jonsson et al in view of Sambrook et al. This rejection is respectfully traversed.

As set forth *supra*, claim 1 has been amended to recite that the gene is "isolated." The primary reference, Jonsson et al, fails to teach the specifically claimed gene or that such a gene can be isolated. Jonsson et al describes a partially purified anthocyanin 5-O-

glucosyltransferase. However, the reference does not describe a purified enzyme or even a partial amino acid sequence. Jonsson et al thus fails to particularly describe an isolated gene as claimed by applicants. Nor would the information in Jonsson et al provide one skilled in the art with sufficient information that could be used to isolate a gene as now claimed. Without even a partial amino acid sequence, it would have been very difficult for a person skilled in the art to clone the isolated genes of the instant invention based upon the description in Jonsson et al.

Since Sambrooke et teaches only methods of cloning, isolating and sequencing of genes or cDNAs, and does not teach anything regarding the claimed genes, Sambrooke et al fails to overcome or remedy the description of Jonsson et al. Even knowing the methods of Sambrooke et al, the claimed invention would not have been obvious.

Withdrawal of the rejection of the claims under §103(a) is thus respectfully requested and believed to be in order.

Claims 1-7, 9-11 and 16-19 have been rejected under 35 U.S.C. §103 as allegedly being unpatentable over Brugliera et al (U.S. Patent No. 5,859,334) in view of Jonsson et al and Sambrooke et al. This rejection is respectfully traversed.

Brugliera et al describes a 3RT gene, not an isolated 5GT gene as instantly claimed. While the reference refers to a 5GT, it does not teach that a 5GT gene has been isolated, obtained or cloned. The specification reference to 5GT is said to be at column 3, lines 30-35 of the reference. Here, Brugliera et al simply sates that the "invention" is directed to an isolated sequence selected from a 5GT and a 3RT. No further information, however,

appears to be given regarding the 5GT gene. This sole statement that the invention is directed to the gene, without any kind of information regarding or identification of the gene, cannot possibly be said to teach or even suggest an isolated gene coding for a 5GT. Therefore, the reference does not teach an isolated gene as instantly claimed.

Nor do the additional references cited in combination overcome or remedy the deficiencies of Brugliera et al. As set forth *supra*, Jonsson et al and Sambrooke et al, each alone or in combination, fail to teach an isolated 5GT gene as instantly claimed. They, therefore, do not cure the lack of a teaching of an isolated 5GT gene in Brugliera et al.

Withdrawal of the rejection of record is thus respectfully requested and believed to be in order.

Further and favorable action in the form of Notice of Allowance is respectfully requested. Such action is believed to be in order.

In the event that there are any questions relating to this amendment or the application in general, it would be appreciated if the Examiner would contact the undersigned attorney be telephone at 508-339-3684 so that prosecution would be expedited.

Respectfully submitted,

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Date: April 16, 2001

Attachment to Amendment dated April 16, 2001

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Page 5, Paragraph Beginning at Line 37

Examples of the DNAs of the present invention include that which codes for the amino acid sequence described in any one of SEQ ID NOs: [7] 2 through [10] 8 or 12. However, proteins having an amino acid sequence modified by addition and/or deletion of one or more amino acids and/or substitutions by one or more other amino acids are also known to maintain enzymatic activity similar to the original protein. Thus, genes coding for a protein that has an amino acid sequence modified by addition and/or deletions of one or more amino acids an/or substitutions by one or more other amino acids relative to the amino acid sequence described in any one of SEQ ID NOs: [7] 2 through [10] 8 or 12, and still maintains activity of transferring a glycoside to the 5 position of a flavonoid, also belong to the present invention.

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Page 6, Paragraph Beginning at Line 15

The present invention also relates to a gene coding for a protein which gene hybridizes to a nucleotide sequence described in any one of SEQ ID NOs: 1 through [4] 7 or [6] 11, or to a nucleotide sequence that codes for an amino acid sequence described therein or to their portions, for example a portion coding for at least six amino acids of a consensus region, under conditions of 2 to 5 x SSC, and for example, 5 x SSC, and 50°C, and that has activity of transferring a glycoside to the 5 position of a flavonoid. Furthermore, the optimum hybridization temperature varies according to the nucleotide sequence and its length, and it is preferable that the hybridization temperature be lower the shorter the nucleotide sequence. For example, a temperature of 50°C or lower is preferable in the case of a nucleotide sequence (18 bases) coding for six amino acids.

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Page 7, Paragraph Beginning at Line 1

Moreover, the present invention also relates to a gene coding for a protein having an amino acid sequence having homology of 30% or more, preferably 50% or more, for example 60% or 70% or more, and in some cases, 90% or more relative to an amino acid sequence of any of SEQ ID NOs: [7] 2 through [10] 8 or 12, and having activity that transfers a glycoside to the 5 position of a flavonoid. Namely, as indicated in Example, DNA coding for the enzyme of the present invention demonstrates homology of 20 to 30% in comparison with other glycosyltransferase genes. Thus, the present invention includes genes coding for a protein that having homology of 30% or more with an amino acid sequence described in any one of SEQ ID Nos: [7] 2 through [10] 8 or 12, and has glycosyltransferase activity.

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Page 7, Paragraph Beginning at Line 15

In addition, as is clear from a comparison of the results of Examples 1 through 4, the amino acid sequence of the enzyme of the present invention varies according to the species, with interspecies homology being 50% or more (see Examples 3 and 4), and for example 60 to 70% (see Example 2), while the homology of the amino acid sequences of the enzymes derived from the same species is 90% or more (see Example 1). Thus, genes coding for a protein that has an amino acid sequence having homology of 50% or more, for example 60-70% or more, and in some cases, 90% or more, relative to an amino acid sequence described in any one of SEQ ID NOs: [7] 2 through [10] 8 or 12, and maintains the glycosyltransferase activity of the present invention are included in the present invention.

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Page 8, Paragraph Beginning at Line 26

Alternatively, the protein can be obtained by using antibody to an amino acid sequence described in any one of SEQ ID NOs: [7] 2 through [10] 8 or 12.

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Page 13, Paragraph Beginning at Line 9

In addition, clones designated as 3R4 and 3R6 were obtained by library screening using the same probes, and these demonstrated an extremely high level of homology with 3R5. The complete nucleotide sequences and deduced amino acid sequences of 3R4 and 3R6 are shown in SEQ ID NO: 1 and SEQ ID NO: [2] 3 of the Sequence Listing, respectively. In addition, the deduced amino acid sequences of the proteins encoded by 3R4 and 3R6 demonstrated homology of 92%.

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Page 17, Paragraph Beginning at Line 16

The cDNA inserted into pSHGT8 had the length of 2062 bp, and included an open reading frame (ORF) consisting of 1386 bp in length (including a stop codon). This sequence is shown in SEQ ID NO: [3] 5. The amino acid sequence of this ORF had homology of 68% with the amino acid sequence of Perilla 5GT encoded by p3R4, and homology of 64% with that encoded by p3R6. In addition, it also had homology of 22 to 25% with the 3GTs of monocotyledonous and dicotyledoneous plants, and homology of 21% with petunia 3RT.

Attachment to Amendment dated April 16, 2001

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Page 19, Paragraph Beginning at Line 3

The cDNA encoded in pSTGT5 was of 1671 bp in length, and included an open reading frame (ORF) consisting of 1437 bp in length (including a stop codon). This sequence is shown in SEQ ID NO: [4] 7. The amino acid sequence of this ORF had homology of 58% with the amino acid sequence of Perilla 5GT encoded by p3R4, [and] homology of 57% with that encoded by p3R6, and[,] homology of 57% with that encoded by Verbena pSHGT8. In addition, it also had homology of 19 to 23% with the 3GT of monocotyledonous and dicotyledoneous plants, and homology of 20% with petunia 3RT.

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Page 20, Paragraph Beginning at Line 17

The pSPGT1 cDNA was 2015 bp in length, and included an open reading frame (ORF) consisting of 1407 bp (including a stop codon). This sequence is shown in SEQ ID NO: [6] 11. The amino acid sequence of this ORF had homology of 57% with that of 5GT encoded by p3R4 of Perilla, homology of 54% with that encoded by p3R6, 55% with that encoded by pSHGT8 of verbena, and 51% of that encoded by pTGT5 of torenia. In addition, it also had homology of 20 to 29% with the 3GT of monocotyledonous and dicotyledoneous plants, and homology of 20% with petunia 3RT. Based on this observation, pSPGT1 cDNA obtained from petunia is considered to code for 5GT.

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Attachment to Reply and Amendment dated April 16, 2001

Marked-up Claims 1-5

1. (Amended) An isolated gene coding for a protein having activity that transfers a glycoside to the 5 position of a flavonoid.

2. (Amended) A gene as set forth in claim 1 that codes for a protein having an amino acid sequence [described] as shown in any one of SEQ ID NOs: 7 through 10 or 12 and having activity that transfers a glycoside to the 5 position of a flavonoid, or a protein having an amino acid sequence modified by addition and/or deletion of one or more amino acids and/or substitutions by one or more other amino acids relative to said amino acids and maintains activity that transfers a glycoside to the 5 position of a flavonoid.

3. (Amended) A gene as set forth in claim 1 that codes for a protein having an amino acid sequence that has homology of 30% or more with an amino acid sequence [described] as shown in any one of SEQ ID NOs: 7 through 10 or 12, and has activity that transfers a glycoside to the 5 position of a flavonoid.

4. (Amended) A gene as set forth in claim 1 that codes for a protein having an amino acid sequence that has homology of 50% or more with an amino acid sequence [described] as shown in any one of SEQ ID NOs: 7 through 10 or 12, and has activity that transfers a glycoside to the 5 position of a flavonoid.

5. (Amended) A gene as set forth in claim 1 that codes for a protein, wherein said gene can be hybridized under conditions of 5 x SCC and 50°C with all or a portion of a nucleotide sequence that codes for an amino acid sequence [described] as shown in any one of SEQ ID NOs: 7 through 10 or 12, and has activity that transfers a glycoside to the 5 position of a flavonoid.